QST Product Review

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ICOM IC-7000 HF/VHF/UHF Transceiver

Reviewed by Mark Wilson, K1RO
QST Product Review Editor

It’s hard to believe that 10 years has passed since QST first reviewed the IC-706, calling it “one of the most exciting new products to come along in years.” The package proved a huge hit, and ICOM kept the radio fresh by following on with the IC-706MKII and IC-706MKIIG. By the time the G version rolled out in 1999, ICOM had added 70 cm, bumped up the power on 2 meters, made DSP noise reduction and notch filter standard, and made quite a few improvements. Meanwhile, ICOM has been busy doing extreme makeovers on the rest of the product line, moving to DSP-based receivers and sophisticated display screens.

Which brings us to the IC-7000. Although the ’7000 is similar to the ’706 in many ways, it also shares features with the IC-756PROIII. ICOM touts the IC-7000 as a mobile transceiver, but, like the ’706, it will find its way into many a suitcase for DXpeditions and Field Day outings. For a lot of hams, it has everything they want and need in a home station radio.

Feature Overview

The IC-7000 covers 160 meters through 70 cm except for 1.25 meters. Power output is 100 W on 160 through 6 meters, 50 W on 2 meters and 35 W on 70 cm. The radio works on the five 60 meter channels available to US operators, and it transmits only when one of those channels is precisely dialed in. The receiver covers 30 kHz to 200 MHz and 400 to 470 MHz. Modes include SSB, CW, AM, FM and RTTY. The receiver has WFM for listening to FM broadcast stations and TV audio.

DSP features include selectable IF filters, adjustable AGC, noise blanker and noise reduction, passband tuning, an automatic notch filter and a two point manual notch filter. In addition, the ’7000 offers a CW memory keyer, RTTY demodulator and digital voice keyer. FM features include scanning, automatic repeater offset, subaudible tones, DTMF memories and other familiar features. Gadget junkies will love this radio.

Hooking it Up

The package is compact and feels quite solid. It’s the same height and width as the IC-706 but not quite as deep. There’s a folding bale on the bottom for desktop use, and the speaker and small fan are both on top. The front panel detaches and ICOM offers several different brackets and separation cables for mobile use.

The radio needs about 22 A at 13.8 V dc. The supplied HM-151 mic plugs into one of two modular jacks — one on the bottom edge of the front panel, the other on the back of the main unit. (You can’t use two microphones simultaneously, though.) A PHONES jack on the right edge of the front panel works with stereo or mono headphones or an external speaker thanks to a SPEAKER/PHONES switch behind the front panel.

The rear panel will be familiar to IC-706 users. There are two antenna jacks, one for 160 to 6 meters and the other for 2 meters and 70 cm. There’s a ¼ inch stereo phone jack for connecting a CW paddle or external keyer. Several ¼ inch phone jacks handle ICOM’s CI-V computer interface (sorry, no USB jack), external speaker and RTTY (FSK keying and PTT). The VIDEO jack is new (more on this later).

The 13-pin AGC jack provides control, band data and audio signals and is used for digital modes, amplifier connections, external tuners or antenna switches. A matching plug is wired with short pigtails — no soldering to minuscule pins! The 6-pin DATA jack can also be used for connecting a TNC or sound card for digital modes. Note that the IC-7000 can handle amplifier key lines up to 16 V dc at 200 mA. Some amplifiers will require a separate keying interface with higher ratings to avoid relay damage.

That Colorful Display

Everyone who used the review radio raved about the ’7000’s color TFT display screen. It measures 2.5 inches diagonally, and is about 2 inches wide by 1.5 inches tall. Before the radio hit the streets there was some trepidation about the readability of such a small, busy display. Let’s face it — many hams (including me) are at the age where things look a little fuzzy and we need to break out the reading glasses when QST arrives.
Those fears were completely unfounded. The incredible resolution, bright colors and excellent contrast make the display easy to read under a variety of lighting conditions and viewing angles. The characters are crisp and clear, and everyone who used the radio could easily see and use the screen labels and graphics. Sure, in a mobile environment or outdoors on a bright day it’s occasionally difficult to see the display, but I found it perfectly readable under most conditions.

One of the menus allows you to change display characteristics such as brightness and contrast. Most photos show the default black background with white lettering, but you can change it to a bright blue background with white letters or a white background with blue letters.

The rear panel VIDEO jack mentioned earlier is an analog video output. For grins I plugged it into the composite video input on my TV, and the IC-7000’s display immediately filled the screen. While this might be useful for a presentation, you’re more likely to hook up one of those small video screens made for portable DVD players or automobile entertainment systems. Note that the composite video output isn’t as crisp as screens made for portable DVD players or automobile entertainment systems.

Controls and Menus

Although the IC-7000 takes some getting used to, ICOM did a good job with the human interface despite a minimum of buttons and panel space to work with. Most buttons have multiple functions, and some menus and controls change according to mode of operation. For the most part I was able to figure out the functions, but I kept the manual close during initial operation.

The main tuning knob has a nice feel. The BAND up and down switches are at the right-hand corners. Pressing one or the other will bring you to the last-used frequency on each band. I like to chase DX on various bands and modes and have grown fond of the band stacking registers on my desktop radio. Repeatedly pressing a band button on the keypad jumps me from SSB to CW to RTTY subbands with filter selection and other settings ready to go.

ICOM has added this convenience to the IC-7000 through the HM-151 microphone. The mic’s keypad resembles the keypad found on the front panel of larger radios and works the same way. There’s a button for each band, and repeated pressing steps you through three band stacking registers. The keypad also works for direct frequency entry. Other HM-151 buttons control common functions.

As mentioned before, there are two mic jacks but you shouldn’t plug in two microphones at the same time. For home station operation with a desk mic or headset it would be nice to plug in a keypad with the HM-151 functions, or else be able to disable the HM-151 mic element and use it as a keypad.

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## Key Measurements Summary

<table>
<thead>
<tr>
<th>Measurement</th>
<th>20 kHz</th>
<th>2 kHz</th>
<th>20 kHz</th>
<th>2 kHz</th>
<th>20 kHz</th>
<th>2 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blocking Dynamic Range (dB)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receiver Sensitivity (dB)</td>
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<td></td>
<td></td>
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<tr>
<td>Adjacent Channel Rejection (dB)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>IF Rejection (dB)</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Image Rejection (dB)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Audio Output (W)</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Key:***
- Noise limited at value shown.
- Off Scale
- Receiver measurements with pre-amp on

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## Bottom Line

The IC-7000 puts compact radio performance and features in a new package. It builds on the IC-706 line, while adding IF DSP features from ICOM’s PRO series. It has what you need to enjoy operating on 13 amateur bands with many of the conveniences found in the full-size boxes.

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**A Note about the Key Measurements Summary**

The Key Measurements Summary shows a specific product’s performance relative to other radios we’ve tested. It’s important to remember that the comparison is to all radios, not just those in the same class as the one tested for this month’s column. Numbers in the “red zone” for a given radio do not mean that performance is “bad” or “unsatisfactory.” Radios can be expected to fall anywhere in the range, and more expensive radios often score better. See January 2006 *QST*, page 69, for more details.
Table 1
ICOM IC-7000, serial number 0501552

Manufacturer’s Specifications

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Power requirement: Receive, 1.6 A (max audio); transmit, 22 A (max).</td>
</tr>
<tr>
<td>Modes of operation: SSB, CW, AM, FM, RTTY (AFSK, FSK), WFM (receive only).</td>
</tr>
</tbody>
</table>

Receiver

SSB/CW sensitivity, bandwidth not specified, 10 dB S/N: 1.8-30 MHz, 0.15 µV; 50-54 MHz, 0.12 µV; 144-148, 430-450 MHz, 0.11 µV.

AM sensitivity, 10 dB S/N: 0.5–1.8 MHz, 13 µV; 1.8-30 MHz, 2 µV; 50-54, 144-148, 430-450 MHz, 1 µV.

FM sensitivity, 12 dB SINAD: 28-30 MHz, 0.5 µV; 50-54 MHz, 0.25 µV; 144-148, 430-450 MHz, 0.18 µV.

WFM sensitivity, 12 dB SINAD: 76-108 MHz, 10 µV.

Blocking dynamic range: Not specified.

Two-tone, third-order IMD dynamic range: Not specified.

Third-order intercept: Not specified.

Second-order intercept: Not specified.

FM adjacent channel rejection: Not specified.

Measured in ARRL Lab

Receive, as specified (sensitivity degrades below 500 kHz); transmit, as specified.

Receiver Dynamic Testing

Noise Floor (MDS), 500 Hz filter:

<table>
<thead>
<tr>
<th>Preamp off</th>
<th>Preamp on</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 MHz</td>
<td>–123 dBm</td>
</tr>
<tr>
<td>3.5 MHz</td>
<td>–128 dBm</td>
</tr>
<tr>
<td>14 MHz</td>
<td>–128 dBm</td>
</tr>
<tr>
<td>50 MHz</td>
<td>–135 dBm</td>
</tr>
<tr>
<td>144 MHz</td>
<td>–133 dBm</td>
</tr>
<tr>
<td>430 MHz</td>
<td>–131 dBm</td>
</tr>
</tbody>
</table>

For 12 dB SINAD:

<table>
<thead>
<tr>
<th>Preamp off</th>
<th>Preamp on</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 MHz</td>
<td>4.1 µV</td>
</tr>
<tr>
<td>3.8 MHz</td>
<td>2.4 µV</td>
</tr>
<tr>
<td>50 MHz</td>
<td>1.0 µV</td>
</tr>
<tr>
<td>144 MHz</td>
<td>1.4 µV</td>
</tr>
<tr>
<td>430 MHz</td>
<td>1.8 µV</td>
</tr>
</tbody>
</table>

For 12 dB SINAD:

<table>
<thead>
<tr>
<th>Preamp off</th>
<th>Preamp on</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 MHz</td>
<td>1.6 µV</td>
</tr>
</tbody>
</table>

Blocking dynamic range, 500 Hz filter:

<table>
<thead>
<tr>
<th>20 kHz</th>
<th>5 kHz/2 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preamp off/on</td>
<td>Preamp off/on</td>
</tr>
<tr>
<td>3.5 MHz</td>
<td>111/109 dB</td>
</tr>
<tr>
<td>14 MHz</td>
<td>112/109 dB</td>
</tr>
<tr>
<td>50 MHz</td>
<td>112/107 dB</td>
</tr>
<tr>
<td>144 MHz</td>
<td>113/103 dB</td>
</tr>
<tr>
<td>430 MHz</td>
<td>112/103 dB</td>
</tr>
</tbody>
</table>

Two-tone, third-order IMD dynamic range, 500 Hz filter:

<table>
<thead>
<tr>
<th>Preamp off/on</th>
<th>Preamp off/on</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 MHz</td>
<td>20 kHz</td>
</tr>
<tr>
<td>14 MHz</td>
<td>89/88 dB</td>
</tr>
<tr>
<td>50 MHz</td>
<td>90/87 dB</td>
</tr>
<tr>
<td>144 MHz</td>
<td>88/90 dB</td>
</tr>
<tr>
<td>430 MHz</td>
<td>83/80 dB</td>
</tr>
</tbody>
</table>

Third-order intercept: Not specified.

Second-order intercept: Not specified.

QS (quick set) menu is mode-sensitive. It includes things like mic gain on SSB, keyer speed on CW, and shift width on RTTY.

PRO-style DSP Features

If you’ve used any of ICOM’s “PRO” radios, the IC-7000’s DSP-based receiver features will be very familiar. You can program three IF filter bandwidth settings for each mode with bandwidths ranging from 50 Hz to 3.6 kHz on SSB/CW and up to 2.7 kHz on RTTY. AM is 200 Hz to 10 kHz, and FM bandwidths are fixed at 15, 10 and 7 kHz. On SSB and CW you can select

Pressing and holding MODE toggles between USB or LSB, CW or CW-R (reverse sideband), RTTY and RTTY-R, and AM, FM and WFM. Other buttons alongside the display are for preamplifier and fixed 12 dB attenuator, optional autotuner control, menu navigation, noise blanker, noise reduction, manual notch filter and automatic notch filter.

The ‘7000 retains the ‘706’s M (menu), S (submenu) and G (graphic menu) labels to help you find things. The arrangement is a bit simpler than the IC-706, but there are still nine menus. The M1 to M3 menus control functions like filter selection, split operation and memories. Menus S1 to S3 include metering, scanning, memory settings and other secondary items. S1 and M3 functions change with mode. Graphic menus G1-3 are for the band scope, multifunction meter and SWR meter.

There’s also an extensive SET MODE menu for adjusting 51 radio parameters. The
Manufacturer's Specifications
Receiver (continued)
FM two-tone, third-order IMD dynamic range: Not specified.

S-meter sensitivity: Not specified.

SSB, 5.6 μV; FM, 0.3 μV.

Receiver audio output: 2 W into 8 Ω at 10% THD.
IF/audio response: Not specified.

Spurious and harmonic suppression: >50 dB
on HF, >60 dB on VHF & UHF.
SSB carrier suppression: >50 dB.
Undesired sideband suppression: >50 dB.
Third-order intermodulation distortion (IMD)
products: Not specified.

CW keyer speed range: Not specified.
CW keyer characteristics: Not specified.
Transmit-receive turn-around time (PTT release
to 50% audio output): Not specified.
Receive-transmit turn-around time (tx delay):
Not specified.
Composite transmitted noise: Not specified.
Size (height, width, depth): 2.3 × 6.6 × 7.3 inches; weight, 5.1 pounds.
Third-order intercept points were determined using SS reference.
*Measurement was noise-limited at the value indicated.
**Measured with 500 Hz filter. Varies with PITCH control setting.

Measured in ARRL Lab
Receiver Dynamic Testing
20 kHz offset, preamp on:
29 MHz, 78 dB; 52 MHz, 75 dB; 146 MHz, 75 dB*; 440 MHz, 70 dB*;
10 MHz offset: 52 MHz, 95 dB; 146 MHz, 84 dB; 440 MHz, 95 dB.

S9 signal at 14.2 MHz: preamp off, 120 μV; 
preamp on, 24 μV; 50 MHz, preamp off,
50 μV; preamp on, 15 μV;
144 MHz, preamp off, 58 μV; 
preamp on, 13 μV; 430 MHz, preamp off,
47 μV; preamp on, 6.9 μV.

At threshold, preamp on: SSB,
14 MHz, 1.4 μV; FM, 29 MHz, 0.23 μV; 
52 MHz, 0.14 μV; 146 MHz, 0.15 μV;
430 MHz, 0.15 μV.

Transmitter
Power output: HF & 50 MHz: SSB, CW, FM, 
100 W (high), 2 W (low); AM, 40 W (high), 
1 W (low); 144 MHz: SSB, CW, FM, 50 W 
(high), 2 W (low); AM, 20 W (high), 2 W 
(low); 430 MHz, SSB, CW, FM, 35 W (high), 
2 W (low); AM, 14 W (high), 2 W (low).

Spurious and image rejection: HF & 50 MHz, 
(except IF/2 rejection on 50 MHz): 70 dB; 
VHF & UHF, (except IF rejection): 65 dB.

Transmitter Dynamic Testing
HF: CW, SSB, FM, typically 110 W high,
1 W low; AM, typ 39 W high, <1 W low;
50 MHz: CW, SSB, FM, typ 97 W high,
<1 W low; AM, typ 38 W high, <1 W low;
144 MHz: CW, SSB, FM, typ 49 W high,
<1 W low, AM, typ 19 W high, <1 W low;
430 MHz: CW, SSB, FM, typ 33 W high;
<1 W low, AM, typ 13 W high, <1 W low.

HF, 59 dB; VHF, 67 dB; UHF, 74 dB.
Meets FCC requirements.

68 dB.
70 dB.

Transmit-receive turn-around time (PTT release
to 50% audio output): Not specified.

Receive-transmit turn-around time (tx delay):
Not specified.

Composite transmitted noise: Not specified.

Size (height, width, depth): 2.3 × 6.6 × 7.3 inches; weight, 5.1 pounds.
Third-order intercept points were determined using SS reference.
*Measurement was noise-limited at the value indicated.
**Measured with 500 Hz filter. Varies with PITCH control setting.

Figure 4 — CW keying waveform for the IC-7000 showing the first two dits in full break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output at 14.2 MHz.

Figure 5 — Worst-case spectral display of the IC-7000 transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 100 W PEP output at 14.2 MHz.

between “sharp” and “soft” filter shapes. I
preferred the sound of the soft settings. They
didn’t sound as harsh and helped with ringing
on CW at narrower bandwidths.

The concentric passband tuning (PBT)
controls in the lower left corner let you nar-
row or shift the passband to help eliminate
interfering signals. When PBT is engaged, a
little window pops up in the display to show
you the settings as you adjust the controls.

The automatic notch filter (ANF) effec-
tively zaps those annoying carriers, reveal-
ing desired signals underneath. It works on
multiple tones and we measured the notch
depth at 40 dB for one tone or two.

What’s different on the ’7000 is a manual
notch filter (MNF) with two adjustable notch
points. We measured notch depth at 50 dB for
one tone or two, and more than 70 dB with
both manual notch filters working together.
After some trial and error, I found that I
could make signals pop out of the crud by
setting points above and below the operating
frequency.

The noise blanker is intended for automo-
tible ignition noise and electrical line noise.
Level and width are adjustable over a wide
range, and I found it effective most of the
time. As usual, there’s a penalty in strong
signal handling. Noise reduction (NR) lowers
the background noise while letting signals
through. At times I noticed some distortion
with the NR engaged, but adjusting the level
helps. We measured the noise reduction at
typically 20 dB maximum, similar to most
DSP radios we’ve tested.

SSB, CW, AM and RTTY all have three
AGC settings (fast, medium, slow). You
can set the time constants for each mode indepen-
dently in 13 steps plus off. FM is fixed.
Some Operating Impressions

Although I've used a number of ICOM radios, the IC-7000 is sufficiently different that for the first few hours of operation it seemed like I was always pressing the wrong buttons. Although the designers did a good job of grouping similar functions and maintaining a consistent way of doing things, it took practice to navigate the features like a pro.

CW Operation: Improved Keying

For CW operation the '7000 includes a 6-60 WPM keyer with four memories and contest serial numbers. Loading the memories is a bit tedious using the function keys and tuning dial, but once it's done, it's done. The manual shows how to make an external keypad with four push buttons to send the CW (or voice) memory keyer contents so that you can use the radio's screen for other functions. The keyer is easy enough to use, but it sure would be nice to have easier access to the SPEED control. It's a setting on the QS menu, and you have to press a few buttons to get to it.

CW keying was an issue with all of the IC-706s and to varying degrees with other ICOM radios. In semi-break-in mode on the '706, the first transmitted dit was noticeably shortened. In QSK mode, the keying sounded choppy, particularly above 30 WPM. The IC-756PROIII review reported that ICOM had finally licked this problem, and as shown in Figure 3, the IC-7000 works correctly as well. The only drawback to using QSK is the sound of the relay clicking, but it didn't bother me with headphones on.

Voice Operation: Can Sound Good, But...

For SSB operation I found the default mic gain settings to be on track but usually dialed the compressor back a few notches. The IC-7000 includes adjustable SSB transmit bandwidth (TBW), which we first saw on the IC-756PROIII. TBW allows you to adjust the SSB transmit filter bandwidth by attenuating frequencies on the high and low side. On the low side, choices are 100, 200, 300 and 500 Hz. On the high side, it's 2500, 2700, 2800 or 2900 Hz. You can store three combinations — wide, mid or narrow — for quick access from the M3 menu. Default settings are 100/2900, 300/2700 and 500/2500 Hz.

Two of the operators who borrowed the '7000 received poor audio reports on SSB. Others received favorable reports. After some experimentation, we found two issues. First — not surprisingly — the HM-151 hand mic is adequate, but if you're looking for hi-fi audio you'll want to consider a different microphone. According to ICOM, the HM-151 is tailored for mobile operation and is designed with restricted response to attenuate road and wind noise. We tried a Heil Handi Mic and Traveler headset, and they sounded good.

A more serious issue is proper adjustment of the TBW settings. We found that the radio sounded fine with TBW at its widest setting, but most people said that the audio at mid and narrow sounded distorted and rough. Sort of like you're talking through a cardboard tube. It was difficult to listen to and not something you'd want to use on the air.

Adjustments on the high side make the audio sound restricted, as you would expect. On the low side, though, the 300 Hz and 500 Hz settings made the radio sound "broken." Even at 200 Hz you can hear something going on, especially with the compressor turned on. Note that the SSB transmit quality monitor does not provide a true representation of what the transmitted signal sounds like. If you want to hear what it really sounds like, you need to listen to yourself in a second receiver.

In the end, I just used the widest TBW settings and received good audio reports from everyone I asked. Nobody found the stock microphone objectionable. With my voice, some listeners thought that the Heil mic sounded better, while others couldn't tell much difference. ICOM says that they have no plans to address the TBW issue and recommend using the widest settings. Although this will disappoint some users, my other transceivers have no TBW-type controls and I've never felt deprived.

On FM with the HM-151 mic, the radio sounded very much like other FM mobile radios with a hand mic. On AM, the modulation sounded a bit "light." You can make contacts with it, but consider something else if hi-fi AM is your main interest.

RTTY and Digital Modes

AFSK RTTY and sound card modes are straightforward once you've made the hardware connections. FSK RTTY requirements are a little more complicated, but the IC-7000 is ready. MARK frequency, shift width and keying polarity are menu-adjustable. With the IF filter flexibility you can dial in the optimum bandwidth, often something other than the usual fixed voice and CW options. RTTY operators have the option of using a special twin peak filter (TPF) that boosts the MARK and SPACE frequencies.

Like the '756PROIII, the IC-7000 has a built-in RTTY decoder. Press DECODE and everything below the frequency display changes into a miniature RTTY screen. The text display on the left has room for six lines of text about 15 characters each. On the right is a compact tuning display complete with a waterfall, mark/space indicator bars and tuning arrows. It's quite easy to use. You'll still need an external RTTY unit of some kind to transmit.

Steve Ford, WB8IMY, used the '7000 in the CQ WPX RTTY contest. As he operated, he compared the internal decoder to the popular MMTTY sound card RTTY software. Although the internal decoder at times couldn't keep up with MMTTY, it did just fine with signals in the clear. Steve praised the twin peak filter, noting that it does wonders for copying signals in heavy QRN.

The radio offers 1200 and 9600 baud packet operation, but we didn't try those modes.

Other Features

With PBT off, the concentric knobs in the lower left corner are used for memory channel selection (inner knob) and for RIT/ATX (outer knob). RIT range is ±9.99 kHz in 10 Hz steps. I didn't really care for the RIT implementation for two reasons. First, you have to crank and crank on the little clicky knob to tune in stations that are a few hundred Hz off frequency. The tuning rate could be faster, or the range narrower, or something. Second, for CW and SSB operation the RIT would be more convenient on the inner knob — it sticks out farther and is easier to grab. Maybe someday you'll be able to assign different functions to the knob.

There are 495 memory channels in 5 banks of 99 channels, 3 pairs of scan edge memories and 2 meter/70 cm call channels. Each memory stores frequency, mode and filter selections. VHF memory features are described below. Memory contents are easy to review via a menu screen and you can add an alphanumeric label. Scanning options include frequencies between selected scan edges, all memories or selected memories.

The "simple band scope" is an improvement over the one found in the IC-706 series, primarily because of the color display. The IC-7000's band scope is like a miniature version of the one on the '756PROIII. It offers fast and slow sweep speeds with steps from ±10 to ±250 kHz. In the fast "one sweep" mode, I expected the band scope to take a single fast sweep and stop, but it went right back to continuous slow-speed sweeping after the fast sweep. I would have liked it better with a setting to take a sweep and pause without having to press HLD (hold) each time I wanted a snapshot.

As noted in the manual, the receiver and band scope sweep functions use the same receive circuit, and "the switching sound may be irritating to listen to." Refreshingly frank, eh? A menu choice attenuates or mutes the audio during fast sweeping so you don't have to listen to it. I used the band scope during the ARRL DX Contest. It helped to locate the pileups when the band was opening and closing.

The IC-7000's built-in digital recorder is similar to the one in the '756PROIII but is much more capable on receive. The recorder in the 'PROIII stores four receive channels of up to 15 seconds each. In the '7000, you can record and store up to 25 minutes of whatever interesting signals you hear on the air. There
are 99 different memories, with a maximum of 120 seconds per memory. It’s very easy to use — just press and hold the front panel ANF/REC button and it will start recording in the next available memory. The MIC MEMO feature allows you to include comments with the recorded audio by speaking into the microphone. There’s a menu screen that allows you to scroll through and play back or clear the recorded memories. Each one is labeled with the date, time, frequency, mode and recording length.

For transmit the IC-7000 voice keyer has four message memories that store up to 90 seconds each, very attractive for storing QSO messages for DXpedition or Field Day use. Again, the menu makes it easy to program and label the memories, and you can adjust the recording level and play them back until you’re happy with the result.

In addition to the usual SWR meter, the IC-7000 can generate a bar graph showing your antenna SWR over a selectable range of frequencies. The bars turn from green to red whenever the SWR is above 1.5:1. The IC-706MKIIIG had a similar feature, but once again the ‘7000’s color display brings it to a new level. Although I couldn’t find it specified in the manual, the SWR meter and graphing function appear to work only on 160 through 6 meters (ANT1).

**VHF/UHF**

Strip away the IC-7000’s HF features, and you have a multimode VHF/UHF transceiver. Standard repeater offsets can be programmed for each band via one of the menus, and you can dial in nonstandard splits using the two VFOs. You can set the shift direction manually or let the radio do it automatically according to frequency range. Transmit and receive frequencies are both displayed.

The ‘7000 includes CTCSS encoding and decoding, as well as digital tone coded squelch. Although the HM-151 keypad doesn’t support DTMF dialing, you can program and store up DTMF strings (up to 24 characters) in four memories.

Note that the IC-7000 receives on one band at a time. There is no sub receiver for satellite operation or monitoring your local repeater while you’re talking on HF. You can set the VFOs to transmit on one band and receive on another, though.

Of course you can store your favorite repeaters in memory, including standard or nonstandard offset and tone settings. Unlike some VHF/UHF FM radios, you can’t program the memories via computer software. They need to be entered manually. It’s not complicated, just tedious if you have a lot.

The receiver covers up to 200 MHz, and thus you can listen to weather channels, the FM broadcast band, AM aircraft frequencies, some TV audio and VHF public service channels. The receiver is quite sensitive in this range and provides some enjoyable listening when the HF bands are dead.

**Small Radio, Big Manual**

At 156 numbered pages, the IC-7000’s manual is twice as thick as the IC-706MKIIIG’s. I found the manual to be easy on the eyes, well written and well illustrated, with small trick with a radio that covers this much ground. I noticed a couple of minor errors, but nothing that prevented me from using the radio.

The format is generally consistent, with major sections for installation and receiving and transmitting on the various modes. A number of tables detail the various menu settings. I downloaded the PDF version from ICOM’s Web site and used Adobe Acrobat’s search feature when I couldn’t find what I was looking for in the printed book. An added bonus: The PDF version has color illustrations.

**Lab Testing**

Lab tests showed the IC-7000 to be more like the IC-706 than the IC-756PROIII. It’s a competent performer, but ICOM didn’t endow this do-everything radio with the competition-focused ‘PROIII’s receiver performance.

The IC-7000’s synthesizer is a significant
improvement over the IC-706 and other small radios we’ve tested. The results can be seen in the transmitted composite noise testing and in the absence of “noise limited” receiver dynamic range measurements. See the accompanying sidebar, “Improved ARRL Lab Transmitter Noise Testing.”

The IC-7000’s sensitivity is a bit lower across the board, most noticeably on HF with the preamp off. That’s not a bad thing, as you don’t always need the sensitivity on HF and you can always engage the preamp with a touch of a button. With the preamp on, the IC-7000’s receiver sensitivity comes in around –140 dBm, typical of today’s radios.

At 20 kHz spacing, with the preamp off, the blocking dynamic range is about 10 dB lower than the IC-7000’s on HF, slightly lower on 6 meters, and slightly higher on 2 meters and 70 cm. The G’s blocking measurements were mostly noise limited, but this wasn’t the case with the IC-7000 and its cleaner synthesizer.

The IC-7000’s IMD dynamic range at 20 kHz spacing is virtually identical to the IC-7000’s, and third order intercept (IP3) numbers are better. With the preamp off, IP3 is a positive number on 80 and 20 meters, always a good sign. To keep things in...
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I used the radio with CT contest software and an interface cable from K1NU to go between the radio and my laptop. It interfaced well. I found the on-board CW memory keyer a little cumbersome to program and use, so I used the one in CT. A Heil Traveler headset rounded out the setup.

The feature that most “grabbed” me was the on-board four channel voice keyer. For a DXpedition, this eliminates a peripheral I have brought along in the past. An Altoids tin is a nice size for building the outboard pushbutton interface shown in the manual to send the voice/CW keyer message memories. I used the voice keyer in the SSB contest. It is relatively simple to change the voice messages. For example, I reprogrammed a message when changing listening frequencies on 40 meters. On-air testing showed there was little or no difference between recorded and live voices.

During the CW contest I used the NR at all times with the default setting. There was a hint of DSP sound, but the reduction in noise level made it possible to copy call signs the first time. I would have needed to ask for fills without the NR. On phone I found that the NR distorted the audio, so I didn’t use it.

Most of the time I used the default 500 Hz CW and 2.4 kHz phone filter settings. I tried both sharp and soft shape and didn’t find any useful difference. When the CW QRM was lower, I opened to the 1.2 kHz filter. I found the 250 Hz CW filter setting too sharp for contesting. A couple of times on CW I used the MNF when someone opened up just below me. It does a good job. On phone, though, I tried adjusting it to eliminate some of the “growl” from a station a kHz below my frequency but couldn’t get it to do what I wanted.

The RIT knob is tiny. It isn’t really useful for tuning back and forth across the frequency to find callers. It would be nice if there were a way to make the “big knob” act as an RIT control. As a workaround, I used split VFO operation so that I could easily tune around the pileup of stations calling in.

I ran 100 W at all times. The set never got hot, even after hours of contest operating. I put my hand on the cabinet and on the heat sink fins many times and I would describe it as lukewarm.

Reports from distant stations showed no difference to speak of between the Traveler and the stock mic. Audio level was comparable, as well as intelligibility. Before the phone contest, I asked a few people to listen to the audio with the IC-7000 and Traveler headset. I ended up setting the TBW for 200 Hz on the low end and the compressor on because they thought it had more punch. During the contest I got a few reports of audio deficiencies, likely from the 200 Hz TBW setting. Based on my experience, I would call the audio “communications quality” but not “broadcast quality.”

Coming from an IC-706 helps the learning curve. I call the IC-7000 an "IC-706PRO," but that term really diminishes its features. The enhanced features are proportional to the difference in the manual size. I have to also say that this is first time in my experience that the weight of the manual approaches the weight of the rig!

I would rate the receiver as excellent. Doing A/B testing next to my old TS-930S showed a significant difference in sensitivity. This IC-7000 could become my new home station radio! — Kurt Pauer, W6PH

DXpedition with the IC-7000

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About that 8 kHz Tone

Not long after the IC-7000 hit the streets, some users reported hearing a low-level 8 kHz tone in the receive audio. We were able to clearly see the tone with a spectrum analyzer. ARRL Test Engineer Michael Tracy, KC1SX, was able to hear the tone with a good pair of hi-fi headphones, but not in the speaker audio.

I couldn’t hear the tone under any circumstances, but I know that my high frequency hearing is poor. My wife Jean, N1OJS, has excellent hearing. She’s often annoyed by high frequency buzzes and whines that I’m oblivious to. When I asked her to listen to the ’7000, with hi-fi headphones she could hear the 8 kHz tone on a quiet band but pronounced it “ever so faint.” She could not hear it with the communications quality headphones in the Heil Traveler headset.

If our experience is typical, users will have widely varying opinions about the importance of this 8 kHz tone. Most people won’t notice, but it will be annoying to those blessed with exceptional hearing, particularly if they use hi-fi headphones. According to ICOM they are working on this issue.

Wrapping it Up

ICOM’s latest compact radio extends the winning streak started with the IC-706 series 10 years ago. Equally at home in your car, base station or vacation spot, it has a boatload of features and competent basic radio performance. Although there are a few rough edges, none are show-stoppers for most operators. ICOM got most everything right with this radio, and it offers a lot of enjoyment in one compact package.

On a few occasions, I’ve referred to the IC-7000 as a “do everything and do it reasonably well” transceiver. If your focus is HF home station operation and you have the table space, check out the ’746 or ’756 series radios. For top-tier HF contest operation, particularly with big antennas, the ’756 or ’7800 offer better radio performance at a higher price. If you just operate VHF/UHF or satellites, there are better choices.

But if, like a lot of hams, you like to do a bit of all of the above, and particularly if you sometimes take your radio with you, the IC-7000 is worth a very close look.